

Phase-Synchronized Modal Mirror Test: Proof-of-Concept

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Research Goal

- Demonstrate full aperture, out-of-plane modal test of a thin, lightweight mirror using phase-locked (stroboscopic) interferometry.

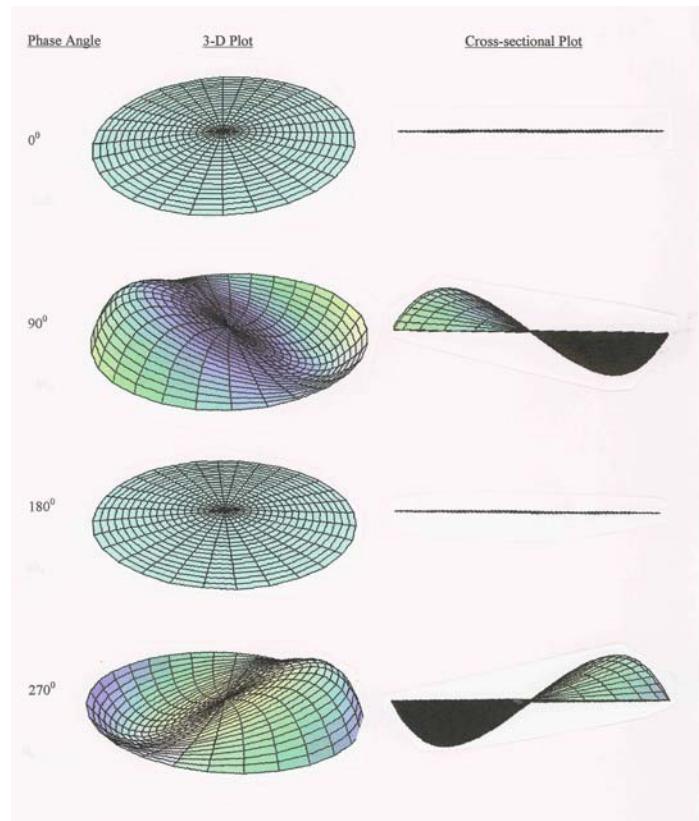
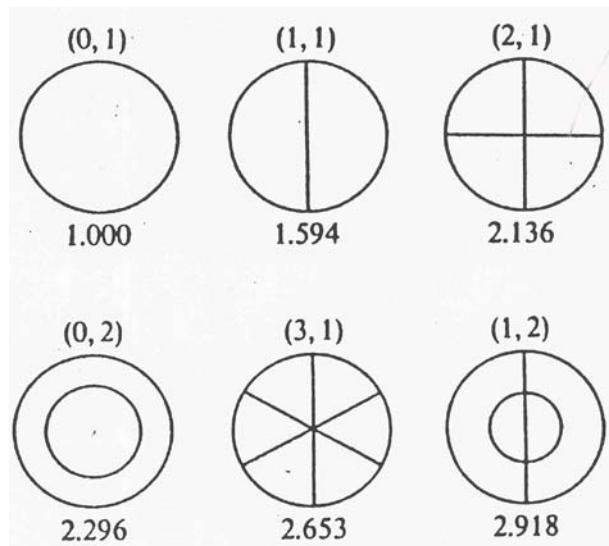
Objectives

- 1) Determine modal frequencies of thin, lightweight mirror,
- 2) Build interferometric modal test bed,
- 3) Develop phase-synchronized and phase-adjustable data acquisition technique, and
- 4) Determine mirror shape while vibrating at resonance.

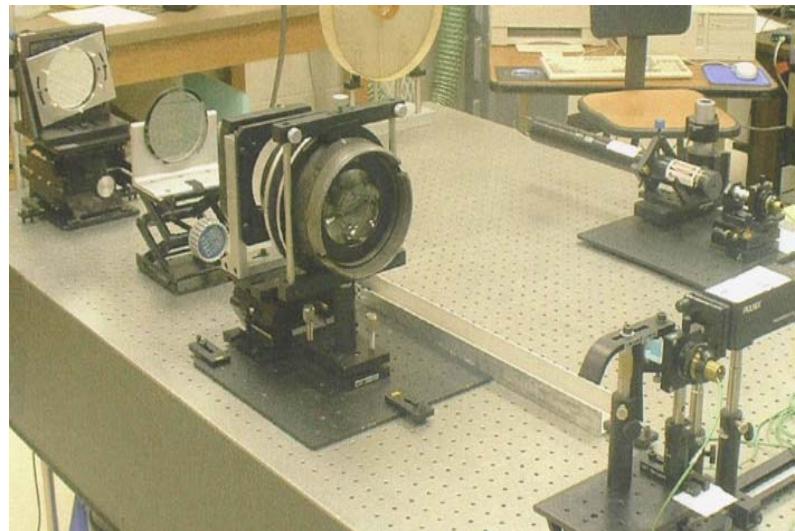
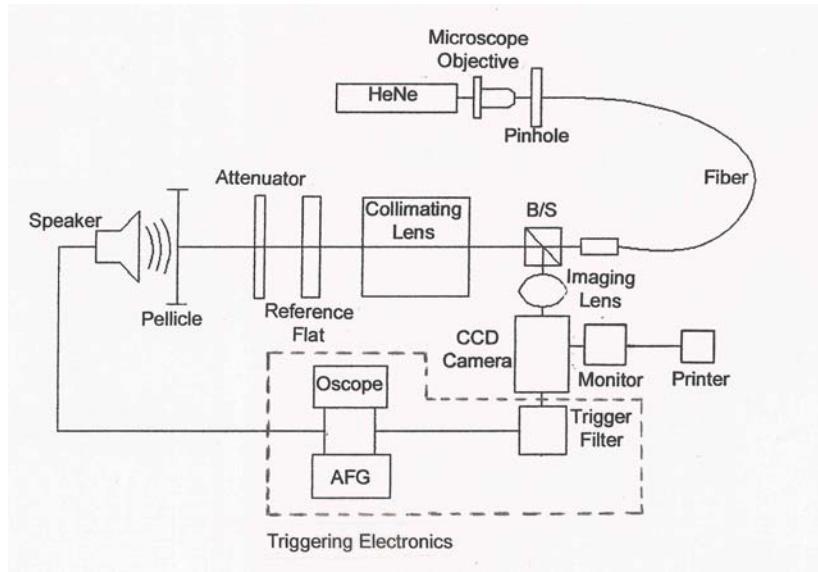
1) Mirror & Excitation



1) Ideal Membrane Modes



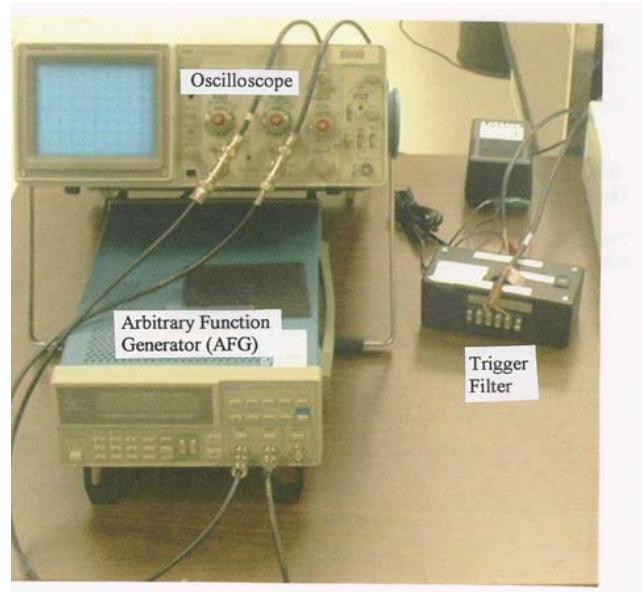
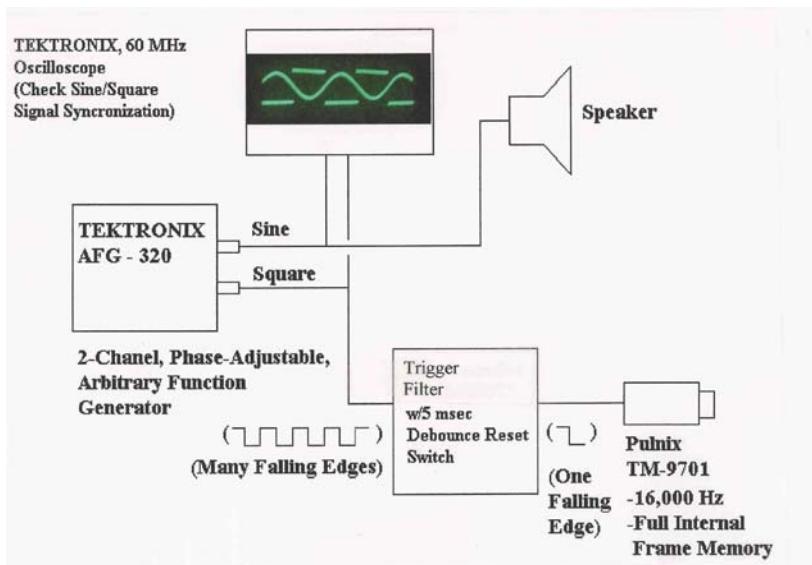
2) Fizeau Modal Test Bed



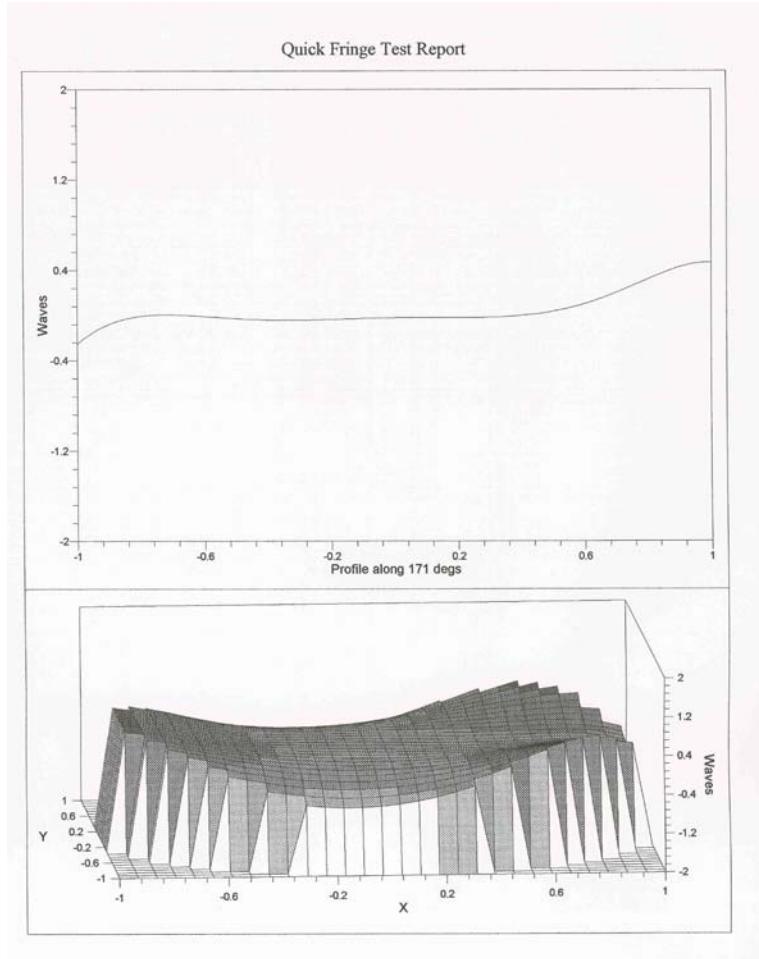
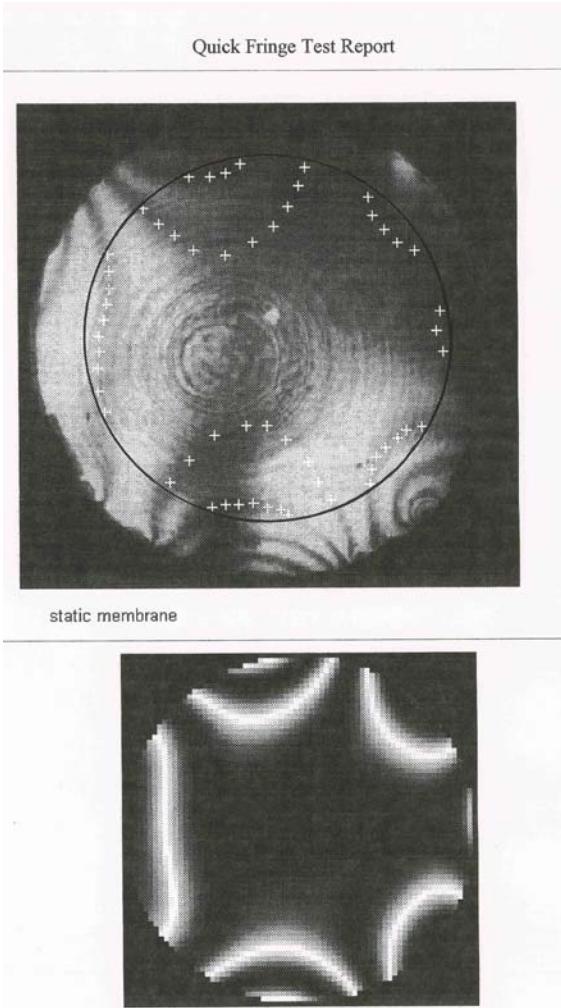
3) Phase-Synchronized Data Acquisition & Triggering

- Variable frequency sine wave signal to speaker.
- Falling-edge TTL signal synchronized to the sine wave that triggers the CCD to scan and hold.
- Phase-adjustable TTL (trigger) signal

3) Phase-Synchronized Data Acquisition & Triggering



4) Interferogram Analysis



4) Mode (1,1) Interferograms

MODE (1,1) @ 356 Hz

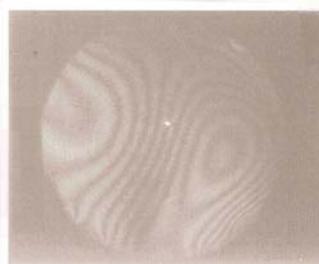


0 degree PHASE

180 degree PHASE



60 degree PHASE



240 degree PHASE

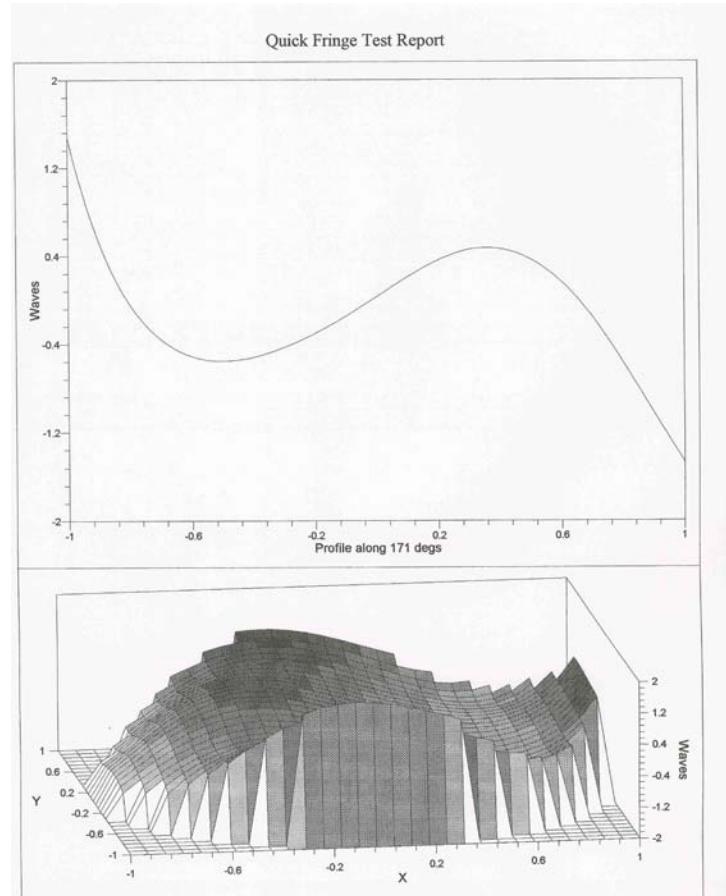
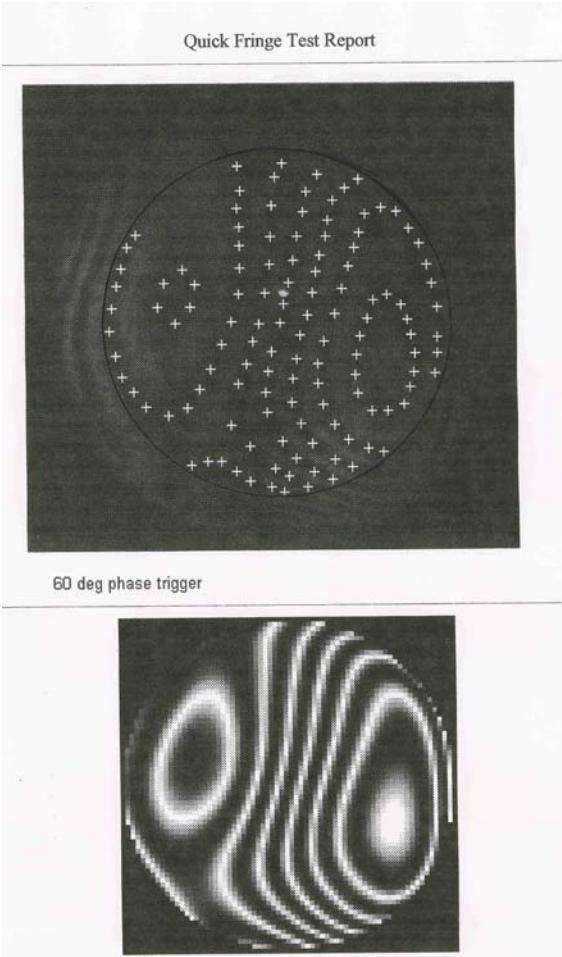


120 degree PHASE

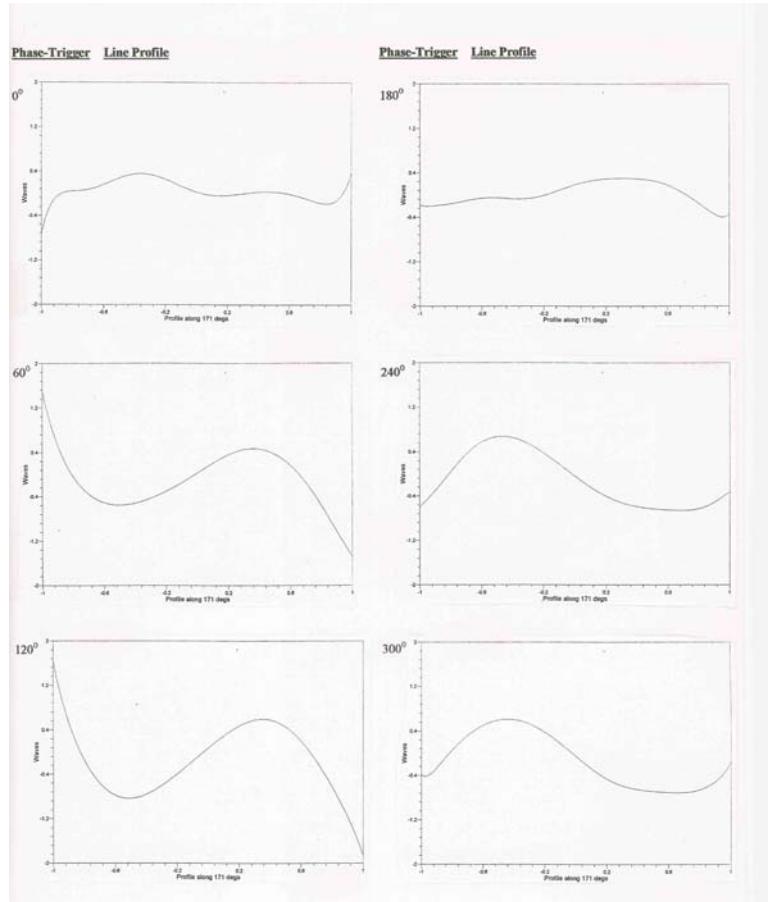


300 degree PHASE

4) Interferogram Analysis



4) Line Profile Summary



Future Test Comparison

Test	Proof-of-Concept	Cryo-Vac
Interferometer	Fizeau	Twyman-Green
Surface	4" pellicle	AMSD specimen
Signal Generator	AFG	IPSI PC
Excitation	Speaker	Shaker
Force driver	Air column	Piano wire stinger
CCD triggering	Phase-synchronized falling-edge square	Phase-synchronized falling-edge TTL
CCD camera	Pulnix TM-9701	Pulnix TM-1040
Data Reduction	Quick-Fringe	Intelliwave

